



FIG. 1

As shown, belt 36 is looped around rollers 37a and 37b, and extends over a portion of a top opening of a chamber. The Office Action stated that belt 36 in the Tan patent could help maintain the temperature of a controlled environment. However, despite the suggestion in the Office Action, the use of belt 36 in the Tan patent does not disclose, teach, or suggest maintaining thermal separation between a heated build chamber and a gantry that controls motion of a dispensing head, as required by claim 1. As shown above in FIG. 1 of the Tan patent, belt 36 does not extend across the entire opening of the chamber. Arrows A-D identify gaps in the opening, which would expose cart subassembly 30 to heat from the chamber (if the chamber was heated). Accordingly, the use of belt 36 does not maintain thermal separation between the chamber and cart subassembly 30.

Additionally, the Crump patent does not disclose, teach, or suggest maintaining thermal separation between a heated build chamber and a gantry that controls motion of a dispensing head, as required by claim 1. In addition to retaining the dispensing head inside the controlled environment, the Crump patent discloses that the mechanisms for controlling motion of the dispensing head 200 and the base member 10 (e.g., carriage 245, and carriage rods 288 and 290) are also retained within the controlled environment.

The successful forming of three-dimensional prototypes or models by the apparatus and process described herein is enhanced and controlled by *placing the entire dispensing head 200, within its cover 202 inside a controlled environment, together with base member 10 and X,Y-Z translation table and guide rod assembly for the dispensing head 200 and the base member 10.* The controlled environment is established inside a transparent cabinet *housing the aforesaid components.*

(the Crump patent, col. 15, lines 21-27) (emphasis added). This is further shown by the illustration in FIG. 13 of the Crump patent. As shown, carriage rods 288 are disposed below the majority of the dispensing head 200 to support the weight of dispensing head 200. As a result, carriage rods 288 are required to be physically located within the controlled environment for supporting the dispensing head 200. Positioning carriage rods 288 outside of the controlled environment would correspondingly place the dispensing head 200 outside of the controlled environment as well. This would effectively prevent the use of the dispensing head 200.

Additionally, the preferred temperature inside the operating cabinet is preferably kept within a range of 40°C to 60°C (the Crump patent, col. 15, lines 35-36). Such temperatures effectively eliminate the need to maintain a physical and thermal separation between the controlled environment and mechanisms for controlling motion of the dispensing head 200 and the base member 10. As such, the Crump patent does not disclose, teach, or suggest maintaining physical and thermal separation between the heated build chamber and the gantry, or any benefits obtained from such an arrangement. Accordingly, claim 1 is patentable over the Crump patent in view of the Tan patent.

Claims 2-7 depend from claim 1, and are allowable therewith. In addition, it is respectfully submitted that the combinations of features recited in claims 2-7 are independently patentable, although this does not need to be specifically addressed herein since any claim depending from a patentable independent claim is also patentable. See M.P.E.P. 2143.03, citing In re Fine, 5 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1988).

## II. Response to Obviousness Rejections of Claims 8-13

Independent claim 8 was rejected under 35 U.S.C. § 103(a) as being obvious over the Crump patent in view of the Tan patent and Anderson, U.S. Patent No. 3,494,853 (“the Anderson patent”).

The Office Action stated that “Crump teaches motion control components (Items 36 and 38 in Fig. 1), but appears to be silent to their relation to the build chamber”. The Office Action also stated that the Tan patent teaches isolation of head motion control components from the chamber, and the Anderson patent teaches isolation of base motion control components from a chamber.

Claim 8 requires that the motion control components are located external to the build chamber and that thermal isolation is maintained between the external motion control components and the build chamber, where the motion control components comprise at least one rail that defines an axis of movement for a dispensing head. As disclosed in the current application, the method of the present invention protects motion control components of gantry 18 (e.g., x-rails 68 and y-rails 70) from elevated temperatures within build chamber 24 by locating the motion control components external to build chamber 24 and by maintaining thermal isolation between the external motion control components and build chamber 24.

In contrast, as discussed above for claim 1, the Crump patent discloses that the mechanisms for controlling motion of dispensing head 200 and base member 10 (e.g., carriage 245, and carriage rods 288 and 290) remain within the controlled environment. The “motion control components” that the Office Action relied on in the Crump patent refer to computer 36 and keyboard 38 (i.e., Items 36 and 38 in Fig. 1 of the Crump patent). Hence, it is believed that the Office Action applied the term “motion control components” to encompass computer 36 and keyboard 38, which are located external to the build chamber. However, computer 36 and keyboard 38 do not include at least one rail that defines an axis of movement for a dispensing head, as required by claim 8. As such, the Crump patent does not disclose, teach, or suggest that the motion control components, which comprise at least one rail that defines an axis of movement for the dispensing head, are located external to the build chamber, or that thermal

isolation is maintained between the external motion control components and the build chamber.

Additionally, as discussed above for claim 1, the Tan patent does not disclose, teach, or suggest that thermal isolation is maintained between the external motion control components for a dispensing head and the build chamber, as required by claim 8. As shown above in FIG. 1 of the Tan patent, belt 36 does not extend across the entire opening of the chamber. Arrows A-D identify gaps in the opening, which would expose cart subassembly 30 to heat from the chamber (if the chamber was heated). Accordingly, the use of belt 36 does not maintain thermal isolation between the chamber and cart subassembly 30.

Furthermore, the Anderson patent does not disclose, teach, or suggest that thermal isolation is maintained between the external motion control components for a dispensing head and the build chamber, as required by claim 8. The Anderson patent is directed to a physical vapor deposition system (i.e., a sputtering system), which involves generating a plasma between a cathode and an anode for depositing ionized gas particles onto a substrate (the Anderson patent, col. 5, lines 3-32). While the sputtering system includes a substrate support that is movable along or in X-Y-Z planes for retaining the substrate (the Anderson patent, col. 6, lines 42-49), the movable substrate is not a gantry system that controls motion of a dispensing head. The portion of the sputtering system that deposits the ionized gas particles onto the substrate (i.e., the cathode and the anode) does not move along or in X-Y-Z planes with the use of motion control components. As a result, claim 8 is patentable over the Crump patent in view of the Tan patent and the Anderson patent.

Claims 9-13 depend from claim 8, and are allowable therewith. In addition, it is respectfully submitted that the combinations of features recited in claims 9-13 are independently patentable, although this does not need to be specifically addressed herein since any claim depending from a patentable independent claim is also patentable. See M.P.E.P. 2143.03, citing In re Fine, 5 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1988).

### III. Response to Obviousness Rejections of Claims 14-20

Independent claim 14 was rejected under 35 U.S.C. § 103(a) as being obvious over the Crump patent in view of the Tan patent and the Anderson patent. The Office Action stated that the Crump patent teaches motion control components (Fig. 1, Items 36 and 38), but appears to be silent to their relation to the build chamber and to the deformable thermal insulator. The Office Action also stated that the Tan patent teaches isolation of head motion control component from a chamber by a deformable thermal insulator, and that the Anderson patent teaches isolation of base motion control components from a chamber.

Claim 14 requires that the motion control components are located external to and in thermal isolation from the build chamber by at least one deformable thermal insulator. The Crump patent does not disclose, teach, or suggest the use of a deformable thermal insulator to cause the motion control components to be located external to and in thermal isolation from the build chamber.

Furthermore, despite the suggestion in the Office Action, the Tan patent does not disclose, teach, or suggest the use of a deformable thermal insulator. Belt 36 of the Tan patent does not thermally isolate cart subassembly 30 from heat located within the chamber (if the chamber was heated). As discussed above for claim 1, belt 36 is only disposed over a portion of the chamber opening, which would expose cart subassembly 30 to heat from the chamber. Accordingly, the belt 36 is not a deformable thermal insulator that thermally isolates cart subassembly 30 from the chamber.

Moreover, the Anderson patent also does not disclose, teach, or suggest the use of a deformable thermal insulator that provides thermal isolation to motion control components of a dispensing head from a build chamber. As discussed above for claim 8, the portion of the sputtering system that deposits the ionized gas particles onto the substrate (i.e., the cathode and the anode) does not move along or in X-Y-Z planes with the use of motion control components. As such, the sputtering system also does not disclose the use of a deformable thermal insulator to thermally isolate any motion control components of the cathode and anode. Accordingly, claim 14 is patentable over the Crump patent in view of the Tan patent and the Anderson patent.

Claims 15-20 depend from claim 14, and are allowable therewith. In addition, it is respectfully submitted that the combinations of features recited in claims 15-20 are independently patentable, although this does not need to be specifically addressed herein since any claim depending from a patentable independent claim is also patentable. See M.P.E.P. 2143.03, citing In re Fine, 5 U.S.P.Q.2d (BNA) 1596 (Fed. Cir. 1988).

Because the prior art made of record does not show, suggest, or teach all the limitations in claims 1-20, pending claims 1-20 are in condition for allowance. Favorable reconsideration and allowance of this application are respectfully requested.

The Commissioner is authorized to charge any additional fees associated with this paper or credit any overpayment to Deposit Account No. 11-0982.

Respectfully submitted,

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